DOCUMENT RESUME

ED 210 076 JC 810 659

AUTHOR Crepin, Dorothy M.
TITLE A Developmental Mathematics Program for Community College Students.
PUB DATE Oct 81
NOTE 13p.

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Community Colleges; Mathematics Anxiety; *Mathematics Curriculum; *Remedial Mathematics; Testing Programs; Two Year Colleges
IDENTIFIERS *Lower Columbia College WA; *Mathematics Laboratories

ABSTRACT

Lower Columbia College (LCC) offers students who need developmental mathematics instruction a variety of courses and instructional formats. In 1977, the developmental mathematics curriculum consisted of two courses: Review Mathematics, offered only through the Math Lab with both desirable and undesirable effects; and Elementary Algebra, offered both in the lab and classroom. High attrition rates in Review Math necessitated several changes. First, an extensive placement testing program was initiated to determine students' mathematical level, goals, and math anxiety level. Next, Math 30, a course beginning at the first-grade arithmetic level, was proposed. Though the course was developed for students with little or no elementary mathematics training, students who have forgotten many math concepts and some foreign students are finding the course useful. The review course was then redesigned to include classroom and lab instruction, self-paced learning, competency-based instruction, and variable credit. Additionally, a one-credit Math Anxiety Workshop was developed; a new course, Introduction to Algebraic Concepts, was designed to ease the transition between the review course and Elementary Algebra; and a third method of instruction for Elementary Algebra was offered, which extends the course to two quarters. LCC's developmental math program attempts to guide students through an initial period of dependence into the regular classroom or lab, using among other techniques a decreasing number of practice tests. (AYC)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED210076

A DEVELOPMENTAL MATHEMATICS PROGRAM FOR COMMUNITY COLLEGE STUDENTS

Dorothy M. Crepin

October 1981

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Dorothy M. Crepin

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

JC 810 659

In the past five years, post-secondary education, and especially the two-year community college system, has been faced with an increasing number of students who need, to greater or lesser degrees, some form of developmental mathematics education.

We now have many people returning to school after a lapse of ten, fifteen, or more years and who certainly need to brush-up on their basic skills.Still others, for whatever reasons, did not complete their elementary school education and are returning to the community college for this purpose and to satisfy G.E.D. requirements. Some students have chosen academic areas of study which are inversely proportional to their mathematics background and, as a consequence, are required to take more mathematics courses than they had anticipated in order to bring their skills to minimum competency levels. In addition, many students who enter college directly from high school are not prepared for college level mathematics. To add to this situation, we are discovering that a large percentage of these students also suffer from Math Anxiety.

I am not certain whether more students today have Math Anxiety than in the past, or whether we are becoming more aware of the problem and are thus better able to identify it. It is also possible that those students who are required to take math courses at a higher level than they had anticipated when they determined their career goals feel an increased anxiety toward the subject.

Rather than try to discuss the reasons for these problems, I would like to present the program which we have developed at Lower Columbia College for the alleviation of them.

Four years ago, the developmental mathematics sequence at Lower Columbia College consisted of two courses: Math 40, Review Mathematics and Math 107, Elementary Algebra. Math 40 covered the following topics:

1) Operations with Whole Numbers
2) Operations with Fractions
3) Operations with Decimals
4) Operations with Percentages.

Math 107, Elementary Algebra, is roughly the equivalent of one year of high school algebra and covers similar topics. At that time, Math 40 was offered only through the Math Lab and, although there are some advantages for the developmental students, there are disadvantages, too. In the Lab situation, a considerable amount of self-discipline and initiave is required of the student. In addition, because of the wide variety of courses offered through the Lab and the number of students taking courses in the Lab, the student must approach the instructor when problems arise. Since the basic philosophy of the Lab is self-paced learning, students are not required to attend the Lab with any regularity. We found that the Math Anxious student would consistently put off the Lab course until the end of the quarter and then take one of two alternatives: many would simply come into the Lab and sign our "Agreement" which allows the Lab Director to assign a grade of "W" (withdrawal) at the end of the quarter rather than the grade of "F" for students not earning a minimum of one (1) credit; or some students would try to complete the course in the last two or three weeks of the quarter because of a need for the credits. This latter course tended to intensify the anxiety rather than alleviate it.

The one advantage of the Lab situation for these students is the self-paced learning and the variable credit offerings. Students

are able to work individually at a pace which suits their individual learning abilities and receive credit for that portion of the course which they complete during the quarter. These students then re-register for the remaining portion of the credits during sequential quarters until the course has been completed. In this manner, a student may work in a 5-credit course for five consecutive quarters or even longer, receiving credits as they are completed.

The Math 107, in contrast, was offered both in the Lab and in the traditional classroom situation thus giving the student a choice between the two modes of instruction.

Although I do not have hard statistical data to show you, conversations with students and their advisors indicate that a large percentage of the mathematically-developmental students did not complete their course of study and, unfortunately, many of them cited the mathematics requirements for their decisions to quit school. The members of the Math Department had feared this. It became important for us to study the problem and determine where the students' needs were greatest. Our studies showed that the greatest attrition rate and the lowest completion rate was in Math 40, Review Mathematics.

As a first step in our efforts to remedy the situation, we initiated an extensive Placement Testing program. In the pre-test interview with each student, we try to determine the student's mathematical ability level, the student's career goals, and whether or not the student has Math Anxiety. The result of this interview is that the student is given a placement test which is at the approximate level of the student's abilities. From the Math 40 placement test our files have grown to include placement tests for Math 30; Math 107; Math 109, Intermediate Algebra; Math 112, College Algebra; and Calculus. After the student has completed as much of the test as possible, the test is corrected and the instructor discusses course

placement based on the results. All in all, we spend approximately fifteen minutes in Mathematics counseling for each placement test we administer. This one-to-one contact with an instructor is important both for the student and for his success in Mathematics.

Our second step was to propose a course which would preceed the Review Math. In this course, Math 30, students learn rather than review the basic concepts of Mathematics, beginning at first- and second-grade level. This course was originally developed for those students who had received little or no math education during elementary school years. However, se have since found that many students have totally forgotten the concepts they did learn and that some, especially the Southeast Asian refugees have had no schooling, so this course serves more students than we had originally anticipated. Students who wish to enroll in Math 30 must take a Math 30 Placement test to determine first, their need for the course and second, their placement within the six-module course. These students are permitted to register only with the written permission of the Math Lab Director or the Department Chairperson.

Our next step in trying to correct the low completion and high attrition was to develop a classroom section of Math 40 which would combine the best attributes of both the classroom and lab situations. These students have the following advantages:

1. an assigned classroom in which class is conducted during a specific hour;
2. an instructor whose interest, training and expertise are in developmental Mathematics education;
3. self-paced learning and variable credit option;
4. minimum achievement, as determined by the instructor, to move from one level to the next and to re-register for a classroom section during subsequent quarters;
5. ability to transfer back into the Lab if necessary;
6. less pressure since all students are studying the same course material;
7. a class limit of 20 students per section ensures that the instructor will have ample time to work with each student.

One of our main objectives in setting up this program was that we had found in the Lab that many students needed to be able to relate consistently to one instructor who would understand their special needs. In the Lab, several instructors share the responsibility of helping students and grading tests at different times during the day, and thus the students work with whichever instructor is on duty at the particular time. If the student attends, say, from 10:30 until 11:30, the student may very well be working with two instructors depending on when the instructors shifts change.

It also became apparent that many students felt uncomfortable working at a table or even in the same area as students studying "higher" Math: algebra, trigonometry, calculus. These students would hesitate to ask questions of either the instructor or the student tutor. The Math 40 classroom section solved these problems and fulfilled these students' needs. During the first two or three quarters we offered this class, students were advised to register for the classroom section during pre- and post-placement test conferences. The class has become so popular, however, that students register simply because of the advantages it offers.

The students feel that we have succeeded well in combining the self-paced, individual study, and variable credit of the Lab situation with the security and continuity of the classroom. We have continued to offer Math 40 in the Lab for those students who do not particularly need the structured atmosphere, for those who have schedule conflicts and those who work rotating shifts. The texts, course syllabus, tests and credit distribution are the same in both the Lab and classroom sections offering easy transfer for students if the need arises.

After offering this class with tremendous success for two quarters, we became aware of two other problems. The first of these was the excessive Math Anxiety of many students which not only kept them from succeeding in Review Math, even in the classroom, but which kept them from filtering into the Lab or regular classroom sections for subsequent work. The second problem was that even those students who successfully completed Math 40 , even in the classroom section, found themselves unable to

keep up with the pressure of the Math 107 and some were unable to grasp with sufficient ease the concepts of algebra.

To solve the first problem, we offered a one-credit Math Anxiety Workshop entitled the "I CAN'T DO MATH" Workshop. This course ran two days a week for three weeks and students met for three hours each day plus a lunch period. The workshop is divided into twelve sessions, two each day.

SESSION	TOPIC
1	Autobiography/Number Puzzles
2	Cartesian graphing (pictographs) Geometry
3	Number systems & Units of Measure Everyday Metrics
4	Everyday Metrics (cont'd.) Stress Management and Test Anxiety (GUEST Speaker)
5	Exploring Ideas in Probability (Guest Speaker) Balancing a Checkbook
6	Fun with Math Optical Illusions Riddles Tangrams Symmetry Student reactions & Evaluations

Although there isn't sufficient time to explain the philosophy of our workshop in detail, I do want to take a little time on it. First of all, we limit enrollment in the workshop to 15 students. Since there is no way we can get 15 students with the same mathematical needs, we make no attempt to have these students reach any level of achievement in Mathematics. Rather, we try to get them to understand their anxieties, to realize that they are not alone in their anxiety, and to determine their present level of Math competency. The basic emphasis in the workshop is not learning Math, but learning to feel more comfortable and at ease, especially with some of the "higher level" concepts such as Probability, Coordinate graphing and the Geometry. When students realize that these "higher Math" concepts are not beyond their abilities to learn, they also realize that the simple arithmetic concepts are within their abilities. When students come to this realization,they find that such everyday tasks as working with metric measurements and balancing the checkbook are not as formidable as

they once seemed.

Although some workshops are run for only one day, afternoon or evening, we found that ours needed to extend over a longer period of time. The continuous feedback from the students is extremely important, as is the longer time line for the students' exposure to math during the workshop.

Another important part of the class is the lunch period. The participants had always evaluated the mathematical autobiography as one of the more important aspects of the course, but there is rarely time in the one-day workshop to carry on discussions or for after-thoughts. Consequently, we try to schedule a break at lunch time and continue discussions regarding various mathematical experiences. This also allows the students to bring up new ideas.

To meet the second problem, that of students who succeed in Math 40 but who annot meet the competencies assumed in the Elementary Algebra course, we developed Math 60, Introduction to Algebraic Concepts, a pre-Algebra course. This course includes the following concepts:

1. Review of the basic operations with Whole Numbers, Fractions, Decimals and Percents
2. Positive and negative numbers.
3. Exponents, Powers and Square Roots.
4. Perimeter, area and circumference of circular and rectangular figures.
5. Angle measurement and Pythagorean Theorem, computing area of triangles.
6. Writing in mathematical language.
7. Solving equations.
8. Ratio and Proportions.
9. The metric system.

For some time, instructors in post-secondary education have been aware that students need a review of the basics, but many of the topics normally covered in junior high math were either glossed-over or not covered at all. Still, these concepts are necessary for a thorough understanding of Elementary Algebra, both in the area of mechanics and in application.

Furthermore, every elementary Algebra text that I have seen seems to assume that the student has had some exposure to and understanding of these concepts. Yet our main difficulty in offering this course has been to find a text. We have been searching for three years and still we have not found a text which is completely adequate. The best we can find is a text which presents the concepts, no matter how well- or how poorly-written. Math 60 is offered both in the classroom in the same manner as the Math 40 and in the Lab. Here again, the text, tests, and credit distributions are identical so as to facilitate transfer between classroom and Lab.

During the past year, we have also been aware that a number of our students who successfully complete Math 60 are still not able to mainstream back into the Lab or traditional classroom for Elementary Algebra. The Lab requires too much self-discipline, and the classroom covers too much material in too short a time for these students. In addition, some of these students still need more individual help and direction than either the classroom or the Lab can adequately provide.

To this end, we developed a third method of teaching Math 107 for Fall Quarter, 1981. This is a "split" class in which the five credits are split between two quarters and the students have the opportunity for a "lab" session with the instructor once each week. This course offers the following advantages to the students:

1. The class meets 4 hours each week.
2. Three of these hours are lecture, including
   time for the lecture
   time for questions
   time to start homework
3. The fourth hour each week is a lab session
4. Attendance is required
5. Although the class meets 4 times weekly, the students register for and receive 3 credits

The remaining two credits will be completed during Winter Quarter with the students registering for and receiving 2 credits but attending class

three times a week, twice for lecture and once for Lab. It is too soon to evaluate this program, but it seems to be well-accepted.

To summarize the developmental program, we offer the following courses:

Math 30	Classroom and Lab
Math 40	Classroom and Lab
Math 60	Classroom and Lab
Math 107	Split, 5 credits/2 quarters
	Lab, variable credit
	Classroom, no variable credit

The Placement Testing program has already been discussed, but I would like to emphasize the fact that the result of placement testing is that students are placed according to current competencies and not according to some course which was completed a number of years ago. Coupled with the actual testing is the counseling the student receives. Few students who have progress as advised have failed to complete their coursework successfully. In addition, the Math Anxious student is also counseled to attend the first Math Anxiety Workshop to be offered. We also have many referrals from other areas of the campus such as the Counseling department, Women's Studies, Non-Traditional Job Opportunities, Vocational and Educational Services areas. We also keep a file indicating when each student took the placement test, which test, the result and subsequent coursework completed.

Our Mathematics Department is very much aware that our program, organized as it is, does not encourage the student to be independent but rather guides the student through a period of dependency and into the regular classroom or the Lab by the time the student is ready for Intermediate Algebra. Our philosophy concerning "practice" tests grew from the need of the students to be totally dependent and then gradually growing toward mainstreaming.

Our Math 30 course is completed when the students have completed all six texts or Modules. For each module there are four practice tests

spaced equally throughout the text, the fourth being at the end. The practice tests are not cumulative but rather concentrate only on that portion of the text covered between tests. The final test, the fifth test for each module is the only test which is actually graded. Although the instructor evaluates each practice test with the student and points out weak areas, the tests are graded only with an OK or with counsel to the student to study the material again and take the second form of the test. These "scores" are not recorded.

In Math 40, there are three short practice tests for each of the four modules. These, like the Math 30 practice tests are not cumulative, and are "graded" in the same manner. With both courses, students are encouraged to take these practice tests, and in some cases these tests are required.

The "weaning" process becomes more evident in Math 60 where students have only one practice test at approximately the half-way point in the chapter, and are then encouraged to take the Competency Diagnostic Test at the end of the chapter in the text. The practice tests cover only that material from the beginning of the chapter to the middle, and the Competency Diagnostic Test is cumulative, covering the entire chapter. Students then take the Chapter Test which is graded.

In Math 107, there are no practice tests, but students are again encouraged to take the Diagnostic Test at the end of each chapter before taking the chapter test. Students are advised that the chapter tests and the Diagnostic Test are similar and that if they do well on the Diagnostic Test they will probably do as well on the chapter test. In the Split Math 107, the instructor may give short "quizzes" which will take the place of the practice tests. However, they will be called quizzes and will be graded. When students have completed this course of Developmental Mathematics, they should be able to handle either the regular classroom or the Lab for Intermediate Algebra.

Our future plans include a developmental Classroom/Lab where students would be able to "drop in" at times other than their scheduled class times and where we would be able to include a variety of teaching materials and devices.

Because our Developmental courses have and are taught by part-time instructors, and students have had difficult times arranging special extra help sessions, a new innovation this Fall has been the assignment of an office which will be shared by these two instructors.

ERIC Clearinghouse for Junior Colleges
96 Powell Library Building
University of California
Los Angeles, California 90024

DEC 30 1981